5176-6006

PM7650
&
PM7660
Marker Plug-in Unit

KAY ELEMETRICS CORP

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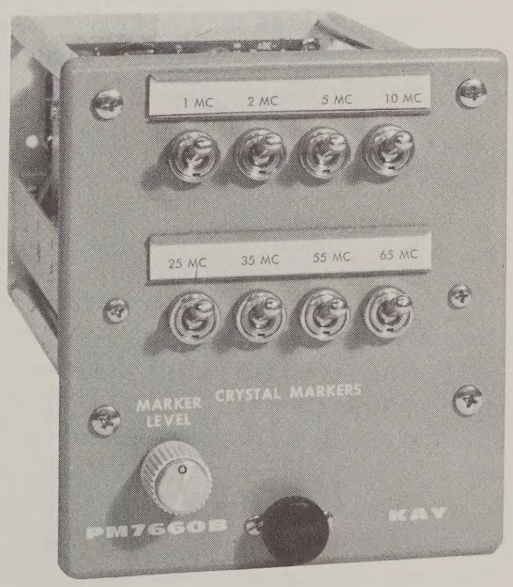
INSTRUCTION MANUAL
ISSUE C

JUNE 1967

PM7650 & PM7660

MARKER PLUG-IN UNITS



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KAY ELECTRIC COMPANY
Pine Brook, N.J.
201-227-2000

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SECTION I

PM-7650 PLUG-IN MARKER HEAD

1.1 INTRODUCTION:

The PM-7650 is a plug-in marker head designed for use with the Marka-Sweep 154 or the Multi-Sweep 159. It provides up to eight fixed frequency markers at customer specified frequencies. Pulse-type markers may be specified between 1 and 100 mc. Individually controlled by front panel toggle switches, these markers may be operated in any combination.

1.2 SPECIFICATIONS:

Markers: Up to 8 pulse-type frequency markers, at customer specified frequencies.

Frequency Range: 1 to 100 mc.

Compatibility: May be used with the Kay Model 154 or 159.

Pip Output: Approx. 7 volts peak.

Sweep Rate: 30 to 60 cps.

1.3 INSTALLATION:

The PM-7650 is shipped complete with crystal markers, installed as specified by the customer. Other auxiliary equipment and interconnecting cables are not furnished.

The frequency markers generated within this plug-in head are present at two separate output jacks; the PIP OUT jack on the PM-7650 and the VERT jack on the basic unit panel. Markers superimposed on the swept r-f output are also available, as described in Section 1.4.

1.4 OPERATING PROCEDURE:

General Operation.

After the instructions provided in the Installation Section have been followed, the frequency markers desired can be energized by placing the associated MARKER switches in the up position. If the frequency of the desired marker is greater than 10 mc, and the sweep width of the instrument is less than 3 mc, the FREQ > 10 MC & SWP W < 3 MC switch should be placed in the up position. The PIP LEVEL control may then be adjusted to provide markers of a convenient amplitude. The PIP ADJ control should be set to provide stable marker pulses for all activated marker positions, with no interaction between switch positions. Optimum setting for the PIP ADJ control is between the points where all activated markers are present and where double-firing occurs.

Internal Markers:

Markers may be superimposed on the swept r-f output by placing the INT-BYPASS switch, located at the rear of the basic rack chassis, in the INT position. These markers will appear as "suck outs" on the r-f signal. When the internal markers are not in use, this switch should be in the BYPASS position. Markers are present at both the PIP OUT and VERT jacks when the INT-BYPASS switch is in the INT position.

1.5 FUNCTION OF CONTROLS AND TERMINALS.

CONTROL OR TERMINAL	POSITION	FUNCTION
CRYSTAL PULSE MARKERS (S-1 thru S-8)	ON (OFF)	Any one of eight frequency markers may be energized by placing the associated switch in the up (ON) position. These markers may be operated singly or in combination.
FREQ > 10 MC & SWP W < 3 MC (S-9)	ON (OFF)	When the marker frequency is greater than 10 MC and the sweep width is less than 3 mc, this switch should be placed in the up position.
PIP LEVEL (R-58)	Variable	Used to vary the amplitude of the markers.
PIP ADJ (External (R-41)	Variable	Used to tune for stable markers.
PIP ADJ #1 (Internal) (R-51) PIP ADJ #2 (Internal) (R-57)	Variable	These controls are set, during alignment, to establish the operating range of the external PIP ADJ controls.
PIP OUT Jack (J-2)	----	Frequency markers, approximately 7 volts peak, are available at this jack.

1.6 CIRCUIT DESCRIPTION:

A sample of the swept r-f signal is fed through the buffer amplifier, located in the basic rack unit, which serves to isolate the marker circuits from the sweep generator. This swept r-f signal is passed to the crystal filters. Since the operation of all the crystal filters is the same, operation with only one crystal energized will be examined. As the swept r-f approaches the resonant frequency of the filter, the instantaneous c-w signal is allowed to pass to the detector. The detected positive pulse is passed through the FREQ > 10 MC & SWP W < 3 MC switch. This signal is fed to the crystal marker amplifier which consists of three 2N1377 transistors in a compound amplifier arrangement. The amplified signals are then used to trigger the pip generator. Finally, these pips are passed through an isolation diode where they become positive pulse markers. The markers are made available at both the PIP OUT and VERT jacks.

1.7 CHECK-OUT PROCEDURE:

Electrical check-out of the PM-7650 may be completed quickly using only a scope. Set up the sweep generator to display the detected response curve of a full sweep. Pips are working properly if the PIP LEVEL control varies the amplitude of the pips, and stable pips can be obtained over a reasonable rotation of the PIP ADJ control. Turning the PIP ADJ control to its minimum position should result in a complete extinguishing of the pips. Approximately 7 volts peak should be available at the PIP OUT jack.

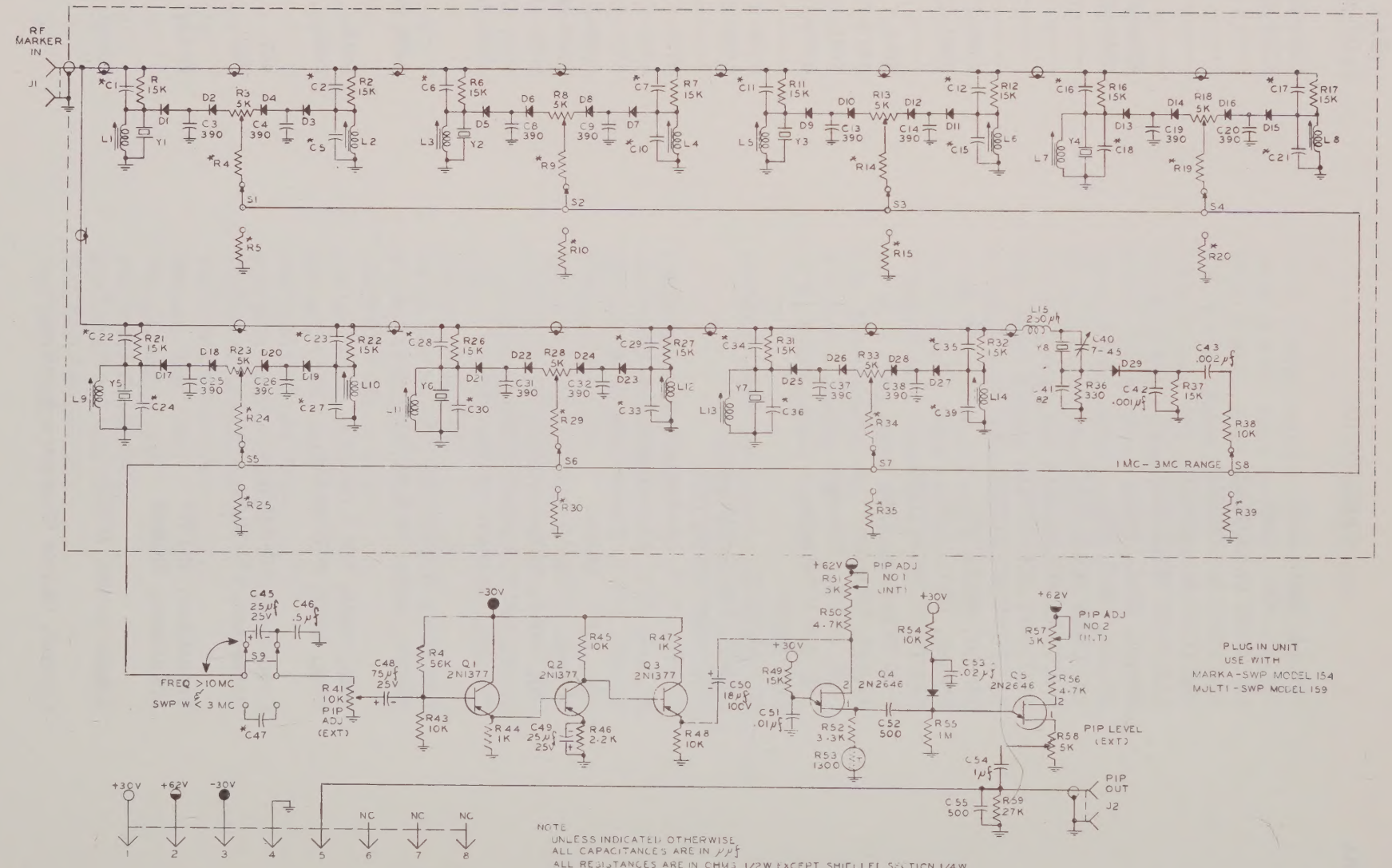
1.8 PARTS REPLACEMENTS:

This section contains the parts list for the PM-7650 head. Satisfactory repairs maybe made by using only exact replacements. To order parts, please reference the instrument type, serial number, circuit designation and the Kay part number.

DWG. SYMBOL NO.	DESCRIPTION	KAY PART NO.
	RESISTORS: (Unless otherwise indicated, all components are fixed composition, $\frac{1}{2}$ watt, 10% tolerance resistors)	
R-1	15 K, $\frac{1}{4}$ watt, Allen Bradley	1531-C
R-2	15 K, $\frac{1}{4}$ watt, Allen Bradley	1531-C
R-3	5 K, CTS Pot	9122-92
R-4	FACTORY SELECTED	-------
R-5	FACTORY SELECTED	-------
R-6	15 K, $\frac{1}{4}$ watt, Allen Bradley	1531-C
R-7	15 K, $\frac{1}{4}$ watt, Allen Bradley	1531-C
R-8	5 K, CTS Pot	9122-92
R-9	FACTORY SELECTED	-------
R-10	FACTORY SELECTED	-------
R-11	15 K, $\frac{1}{4}$ watt, Allen Bradley	1531-C
R-12	15 K, $\frac{1}{4}$ watt, Allen Bradley	1531-C
R-13	5 K, CTS Pot	9122-92
R-14	FACTORY SELECTED	-------
R-15	FACTORY SELECTED	-------
R-16	15 K, $\frac{1}{4}$ watt, Allen Bradley	1531-C
R-17	15 K, $\frac{1}{4}$ watt, Allen Bradley	1531-C
R-18	5 K, CTS Pot	9122-92
R-19	FACTORY SELECTED	-------
R-20	FACTORY SELECTED	-------
R-21	15 K, $\frac{1}{4}$ watt, Allen Bradley	1531-C
R-22	15 K, $\frac{1}{4}$ watt, Allen Bradley	1531-C
R-23	5 K, CTS Pot	9122-92
R-24	FACTORY SELECTED	-------
R-25	FACTORY SELECTED	-------
R-26	15 K, $\frac{1}{4}$ watt, Allen Bradley	1531-C
R-27	15 K, $\frac{1}{4}$ watt, Allen Bradley	1531-C
R-28	5 K, CTS Pot	9122-92
R-29	FACTORY SELECTED	-------
R-30	FACTORY SELECTED	-------
R-31	15 K, $\frac{1}{4}$ watt, Allen Bradley	1531-C
R-32	15 K, $\frac{1}{4}$ watt, Allen Bradley	1531-C
R-33	5 K, CTS Pot	9122-92
R-34	FACTORY SELECTED	-------
R-35	FACTORY SELECTED	-------
R-36	330, $\frac{1}{4}$ watt, Allen Bradley	3311-C
R-37	15 K, $\frac{1}{2}$ watt, Allen Bradley	1531-E
R-38	10 K, $\frac{1}{2}$ watt, Allen Bradley	1031-E
R-39	FACTORY SELECTED	-------
R-40	NOT USED	-------

DWG. SYMBOL NO.	DESCRIPTION	KAY PART NO.
R-41	10 K, 2 watt ohmite, Papered Pot	9122-97
R-42	56 K, ½ watt, Allen Bradley	5631-E
R-43	10 K, ½ watt, Allen Bradley	1031-E
R-44	1 K, ½ watt, Allen Bradley	1021-E
R-45	10 K, ½ watt, Allen Bradley	1031-E
R-46	2.2 K, ½ watt, Allen Bradley	2221-E
R-47	1.5 K, ½ watt, Allen Bradley	1521-E
R-48	10 K, ½ watt, Allen Bradley	1031-E
R-49	15 K, ½ watt, Allen Bradley	1531-E
R-50	4.7 K, ½ watt, Allen Bradley	4721-E
R-51	5 K, Allen Bradley Pot	142
R-52	3.3 K, ½ watt, Allen Bradley	3321-E
R-53	1300, Thermistor, Fenal KA 31L5	10065
R-54	10 K, ½ watt, Allen Bradley	1031-E
R-55	1 Meg, ½ watt, Allen Bradley	1051-E
R-56	4.7 K, ½ watt, Allen Bradley	4721-E
R-57	5 K, Allen Bradley Pot	142
R-58	5 K, Allen Bradley Pot	142
R-59	27 K, ½ watt, Allen Bradley	2731-E
	CAPACITORS: (All capacitances in μμf, 500 volts, unless otherwise specified.)	
C-1	FACTORY SELECTED	-------
C-2	FACTORY SELECTED	-------
C-3	390 μμf, RMC 25U	6360-27
C-4	390 μμf, RMC 25U	6360-27
C-5	FACTORY SELECTED	-------
C-6	FACTORY SELECTED	-------
C-7	FACTORY SELECTED	-------
C-8	390 μμf, RMC, 25U	6360-27
C-9	390 μμf, RMC, 25U	6360-27
C-10	FACTORY SELECTED	-------
C-11	FACTORY SELECTED	-------
C-12	FACTORY SELECTED	-------
C-13	390 μμf, RMC, 25U	6360-27
C-14	390 μμf, RMC, 25U	6360-27
C-15	FACTORY SELECTED	-------
C-16	FACTORY SELECTED	-------
C-17	FACTORY SELECTED	-------
C-18	FACTORY SELECTED	-------
C-19	390 μμf, RMC, 25U	6360-27
C-20	390 μμf, RMC, 25U	6360-27
C-21	FACTORY SELECTED	-------
C-22	FACTORY SELECTED	-------
C-23	FACTORY SELECTED	-------
C-24	FACTORY SELECTED	-------

DWG. SYMBOL NO.	DESCRIPTION	KAY PART NO.
C-25	390 μμf, RMC, 25U	6360-27
C-26	390 μμf, RMC, 25U	6360-27
C-27	FACTORY SELECTED	-------
C-28	FACTORY SELECTED	-------
C-29	FACTORY SELECTED	-------
C-30	FACTORY SELECTED	-------
C-31	390 μμf, RMC, 25U	6360-27
C-32	390 μμf, RMC, 25U	6360-27
C-33	FACTORY SELECTED	-------
C-34	FACTORY SELECTED	-------
C-35	FACTORY SELECTED	-------
C-36	FACTORY SELECTED	-------
C-37	390 μμf, RMC, 25U	6360-27
C-38	390 μμf, RMC, 25U	6360-27
C-39	FACTORY SELECTED	-------
C-40	7-45 Trimmer, Erie	6358-7
C-41	82 mfd, Elmenco	6359-72
C-42	.001, 600 V, Elmenco	6899-10
C-43	.02, 100 V Elmenco	6899-13
C-44	NOT USED	-------
C-45	25 mfd, 25 V	6355-4
C-46	.5 mfd, 100 V, Elmenco	6899-21
C-47	FACTORY SELECTED	-------
C-48	75 mfd, 25 V, Electrolytic	6355-80
C-49	25 mfd, 25 V, Electrolytic	6355-4
C-50	18 mfd, 100 V, Electrolytic	6355-73
C-51	.01, 100 V, Mylar	6899-12
C-52	500 μμf, Molded Mica	6359-66
C-53	.02, 100 V, Elmenco	6899-13
C-54	1 mfd, 100 V, Cornell Dublier	6411-17
C-55	500 mfd, Elmenco (Molded Mica	6359-66
L-1 - L-14	FACTORY SELECTED	-------
L-15	250 MH, Miller 70 F 224B1	6394-36
P-1	Plug, Male, #26 - 182	8611
P-2	Plug, Male, UG-1050/u	7661
J-1	Connector, UG-625/u	451
J-2	Connector, UG-88/u	213
Q1-3	Transistor, 2N1377	K-134
Q4-5	Transistor, 2N2646	
S-1, S-9	Toggle Switch, DPDT	254-A
Y-1 - Y-8	Crystal, Quartz (Customer Specified)	



NOTE
UNLESS INDICATED OTHERWISE
ALL CAPACITANCES ARE IN μμf
ALL RESISTANCES ARE IN OHMS 1/2W EXCEPT SHIELDED SECTION 1/4W
* FACTORY SELECTED COMPONENTS MAY BE DELETED

DWG. NO. C9592 A SCHEMATIC PM 7650 B

SECTION II

PM-7660 PLUG-IN MARKER HEAD

2.1 INTRODUCTION:

The PM-7660 is a crystal-controlled marker plug-in head designed for use with the Marka-Sweep 154 and Multi-Sweep 159 instruments. Up to eight birdie-type frequency markers, at customer-specified frequencies, are avialable over a 1 to 300 mc frequency range. Markers are individually controlled by front panel toggle switches, and may be activated in any combination. The MARKER LEVEL control is used to vary the amplitude of the markers.

Harmonic markers are available for the PM-7660. One marker position must be used for a harmonic generator, which will accommodate up to seven multiple-frequency marker circuits. Single-frequency marker circuits may be combined in the same plug-in unit.

2.2 SPECIFICATIONS:

Markers: Up to eight birdie-type frequency markers at customer specified frequencies.

Frequency Range: 1 to 300 mc.

Compatibility: May be used with the Multi-Sweep 159 and Marka-Sweep 154 sweeping oscillators.

2.3 CIRCUIT DESCRIPTION:

Schematics C8500 and A8744 may be used when following this description. When switch S-8 is closed, a negative voltage is applied to the collector of the oscillator. The transistor then oscillates at the frequency of the crystal. This c-w signal is mixed with the swept r-f input signal, entering the plug-in head at P-2, in diode D-1. When the swept r-f approaches the oscillator frequency, an audio beat note is produced. This is amplified by the audio amplifier and leave the plug-in head through P-1. Before appearing at the VERT jack, this signal is amplified again by the birdie marker amplifier in the sweep oscillator unit.

2.4 CHECK-OUT PROCEDURE:

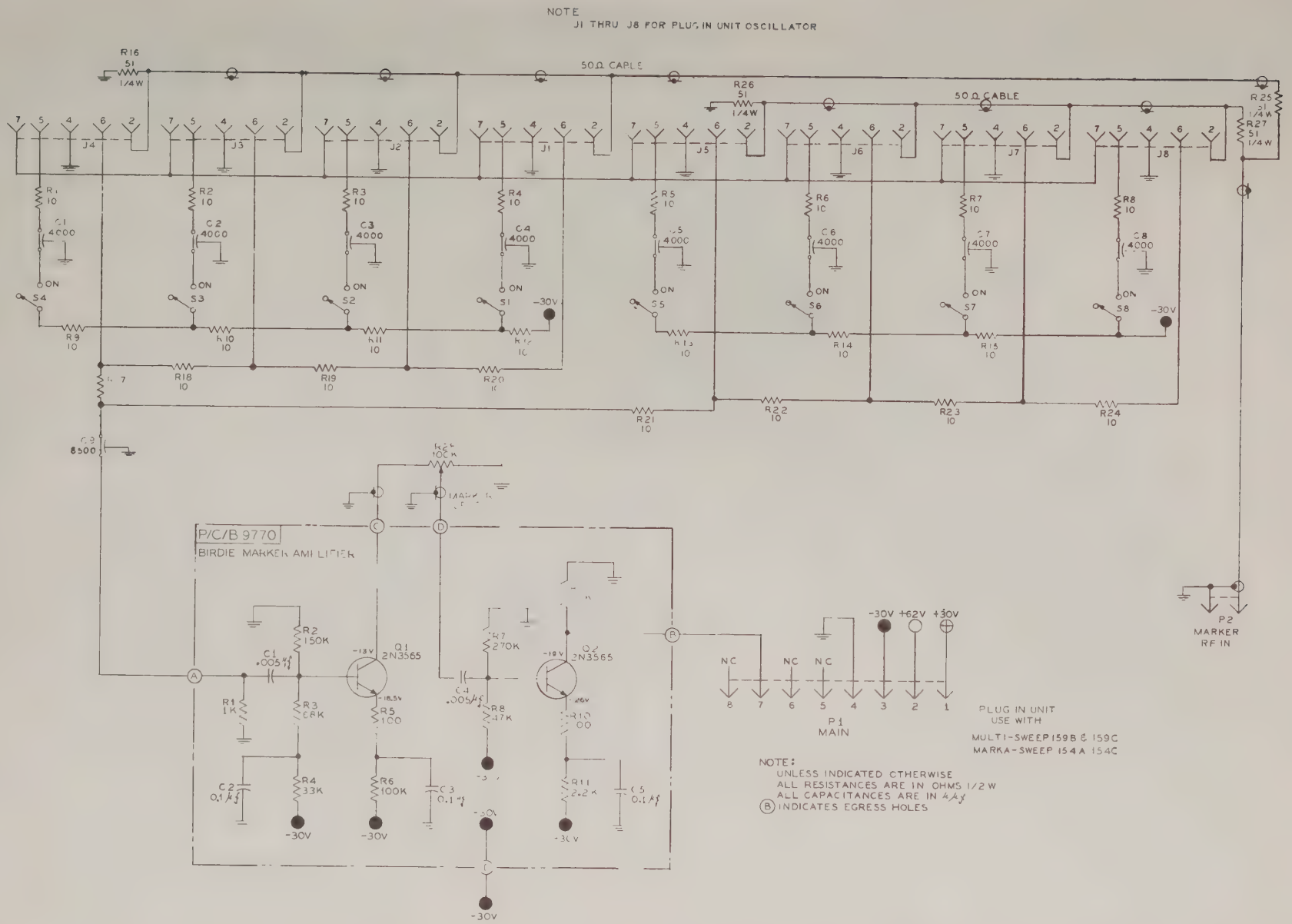
To check the performance of the PM-7660, set up the basic sweep unit to display a detected response curve on a scope screen. Then turn the MARKER LEVEL controls, on both the plug-in and the basic sweep unit, to maximum. There should be a birdie of about 2 volts p-p visable on the response for each fundamental marker in use; birdies from harmonic markers will have somewhat lower amplitude.

2.5 PARTS REPLACEMENTS:

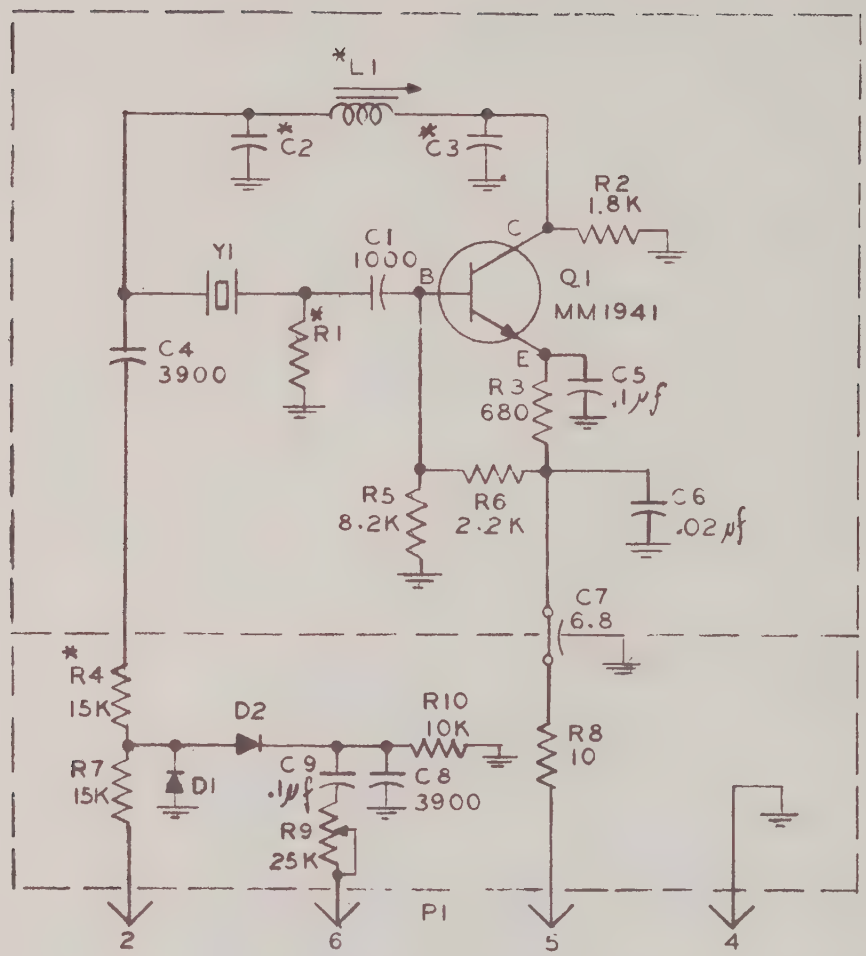
This section contains the parts list for the PM-7660 head. Satisfactory repairs maybe made by using only exact replacements. To order parts, please reference the instrument type, serial number, circuit designation and the Kay part number.

DWG. SYMBOL NO.	DESCRIPTION	KAY PART NO.
C1-8	4000 μf, 500 V, Ceramic Feedthru	6356-5
C-9	8500 μμf, 500 V, Ceramic Feedthru	6356-7
R1-24	10 Ω, ½ watt, Allen Bradley	1001-E
R-16	51 Ω, ¼ watt, 5%	5105-C
R25-27	51 Ω, ¼ watt, 5%	5105-C
R-28	100 K, Allen Bradley Pot	121
S-1 - S-8	Toggle Switch SPST	255
J1-8	Socket, 7 Pin Minature	8717
P-1	Connector, 8 Pin Male	8611
P-2	Connector, UG-1050/u	7661

DWG. SYMBOL NO.	DESCRIPTION	KAY PART NO.
P/C/B 9770	Birdie Marker Amplifier Board (Complete)	9770
C-1	.005, 100 V, Elmenco	6899-14
C-2	.1, 50 V, Paktron, ±10% MW600LL	6411-20
C-3	.1, 50 V, Paktron, ±10% MW600LL	6411-20
C-4	.005, 100 V, Elmenco	6899-14
C-5	.1, 50 V, Paktron, ± 10% MW600LL	6411-20
R-1	1 K, ½ watt, Allen Bradley	1021-E
R-2	150 K, ½ watt, Allen Bradley	1541-E
R-3	68 K, ½ watt, Allen Bradley	6831-E
R-4	33 K, ½ watt, Allen Bradley	3331-E
R-5	100 Ω, ½ watt, Allen Bradley	1011-E
R-6	100 K, ½ watt, Allen Bradley	1041-E
R-7	270 K, ½ watt, Allen Bradley	2741-E
R-8	47 K, ½ watt, Allen Bradley	4731-E
R-9	10 K, ½ watt, Allen Bradley	1031-E
R-10	100 Ω, ½ watt, Allen Bradley	1011-E
R-11	2.2 K, ½ watt, Allen Bradley	2221-E
Q-1	2N3565	K172
Q-2	2N3565	K172



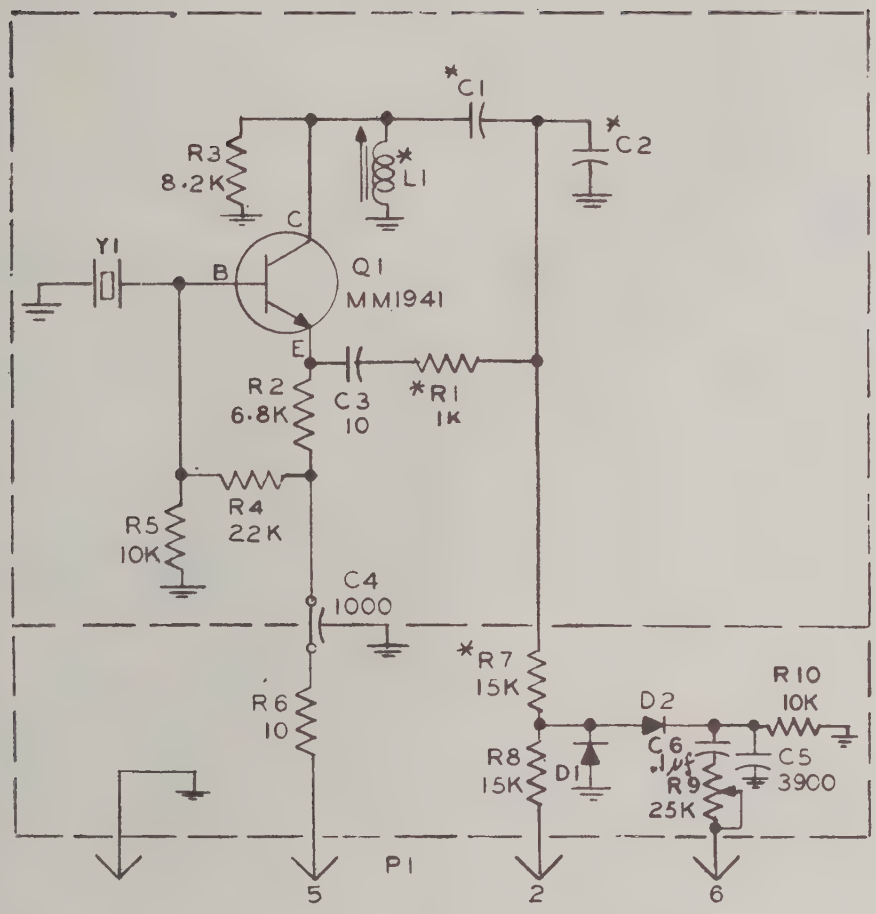
DWG. NO. C 8500D PM7660 SCHEMATIC



NOTE
UNLESS INDICATED OTHERWISE
ALL RESISTANCES ARE IN OHMS 1/4W
ALL CAPACITANCES ARE IN μμf
* FACTORY SELECTED

SCHEMATIC (PLUG IN UNIT) 1–13MC OSCILLATOR (SINGLE FREQ)

DWG. NO. A8744 F



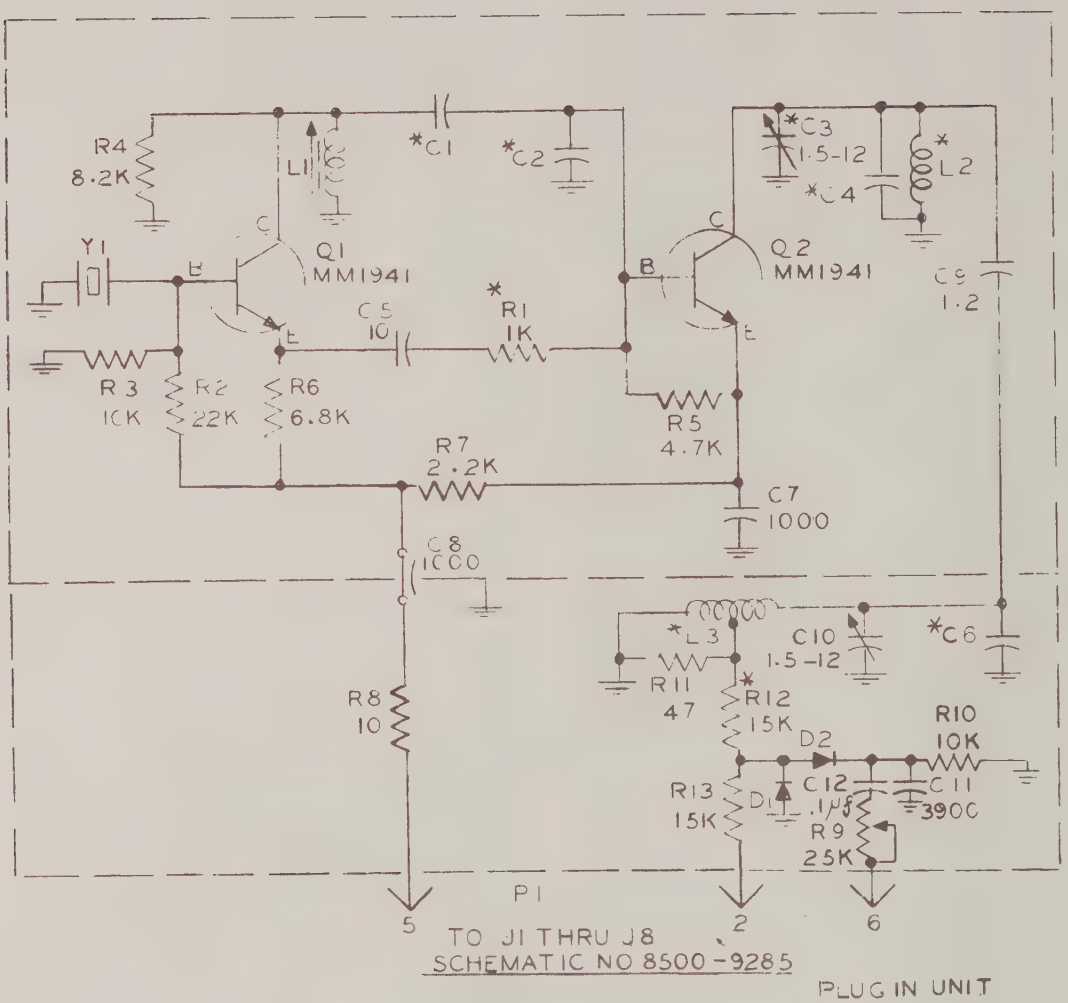
TO J1 THRU J8
SCHEMATIC NO 8500-9285

NOTE
UNLESS INDICATED OTHERWISE
ALL RESISTANCES ARE IN OHMS 1/4W
ALL CAPACITANCES ARE IN μμf
*FACTORY SELECTED

PLUG IN UNIT
USE IN
MULTI-SWP 159
MARKA-SWP 154
MARKA-SWP 1500

SCHEMATIC (PLUG IN UNIT) 13-100 MC OSCILLATOR (SINGLE FREQ)

DWG. NO. A 8745 D

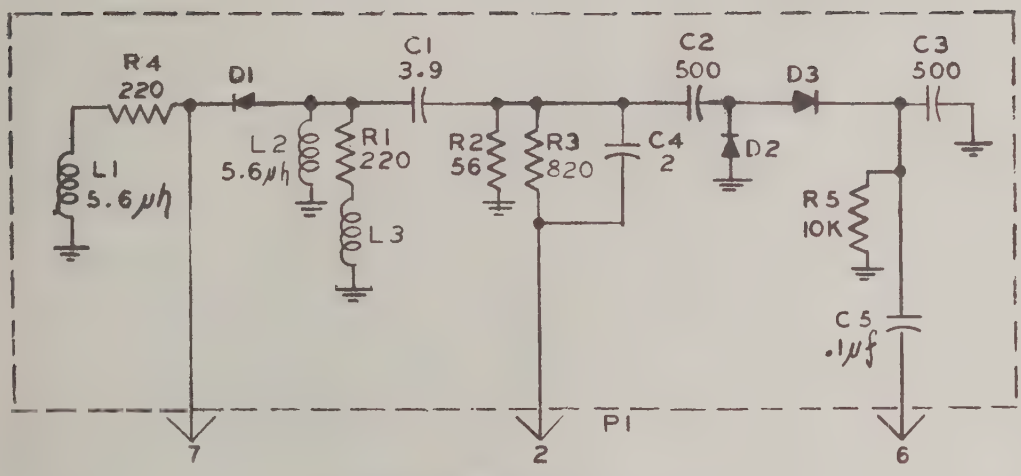


PLUG IN UNIT
USE IN
MULTI-SWP 159 / MARKA-SWP 154
MARKA-SWP 1500

NOTE
UNLESS INDICATED OTHERWISE
ALL RESISTANCES ARE IN OHMS 1/4W
ALL CAPACITANCES ARE IN $\mu\mu f$
*FACTORY SELECTED

SCHEMATIC (PLUG IN UNIT) 100-300MC OSCILLATOR (SINGLE FREQ)

DWG. NO. A8746C



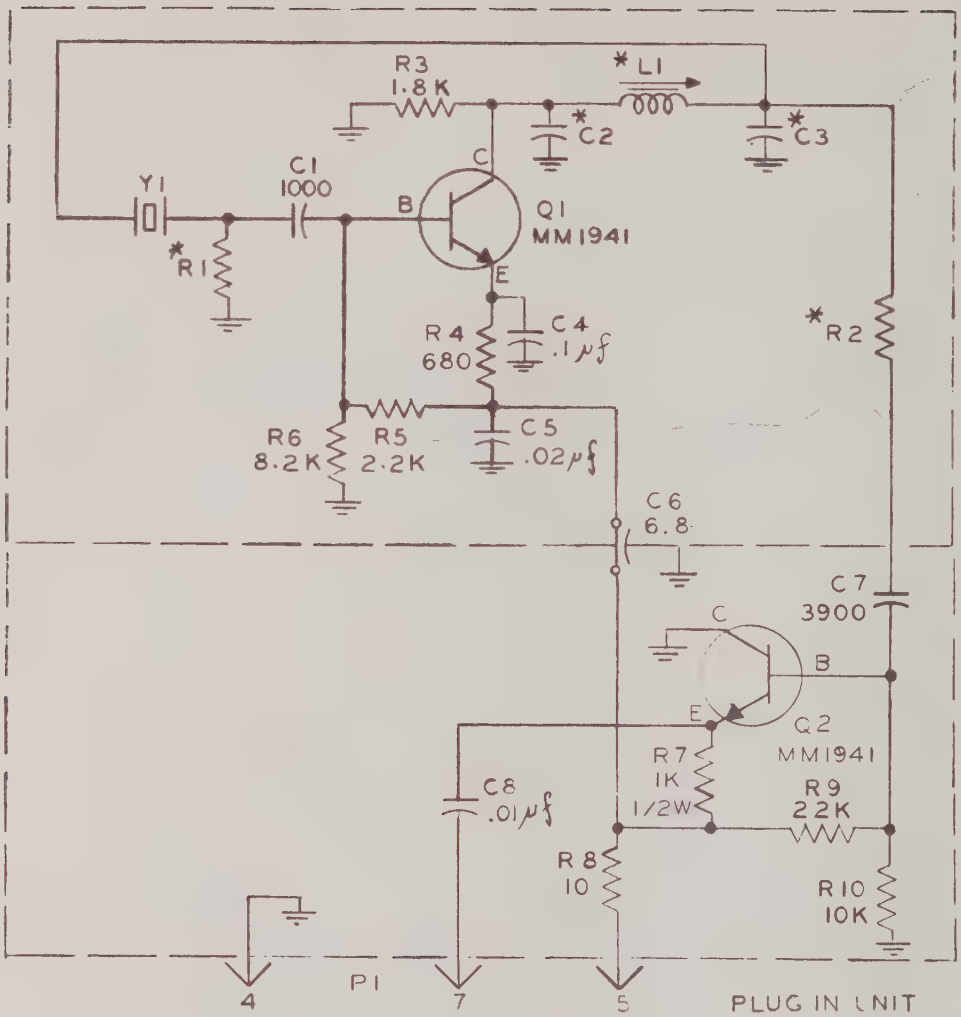
TO J1 THRU J8
SCHEMATIC NO 8500-9285

NOTE
UNLESS INDICATED OTHERWISE
ALL RESISTANCESS ARE IN OHMS 1/4W
ALL CAPACITANCES ARE IN μμf
*FACTORY SELECTED

PLUG IN UNIT
USE IN
MULTI-SWP 159 / MARKA-SWP 154
MARKA-SWP 1500

SCHEMATIC (PLUG IN UNIT) HARMONIC GENERATOR STANDARD

DWG. NO. A8747B



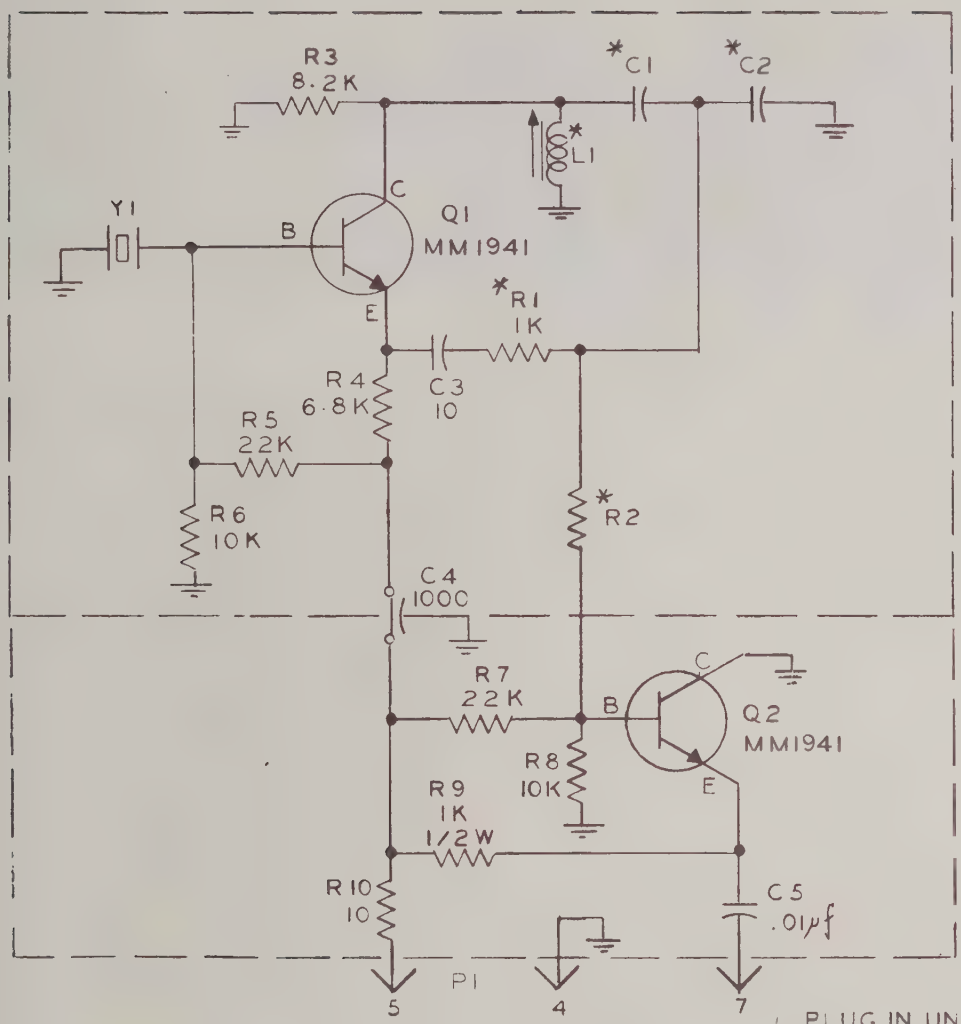
NOTE

UNLESS INDICATED OTHERWISE
ALL RESISTANCES ARE IN OHMS 1/4W
ALL CAPACITANCES ARE IN μμf
* FACTORY SELECTED

PM 7660 - PM 861

SCHEMATIC (PLUG IN UNIT) 1 - 13MC OSCILLATOR (FOR HARMONIC GEN)

DWG. NO. A 8748 D



NOTE
UNLESS INDICATED OTHERWISE
ALL RESISTANCES ARE IN OHMS 1/4W
ALL CAPACITANCES ARE IN μμf
* FACTORY SELECTED

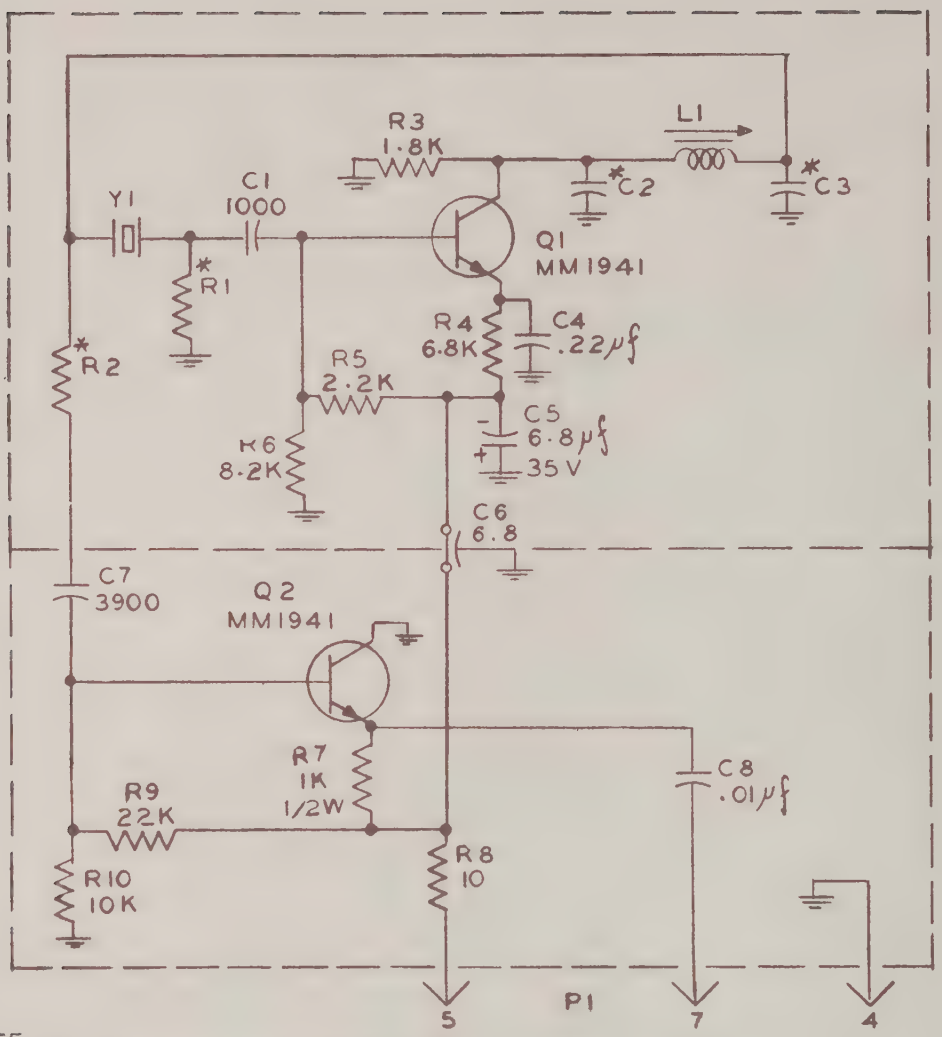
TO J1 THRU J8
SCHEMATIC NO 8500-9285

PLUG IN UNIT
USE IN
MULTI-SWP 159 / MARKA-SWP 154
MARKA-SWP 1500

PM 7660 - PM 861

SCHEMATIC (PLUG IN UNIT) 13-100MC OSCILLATOR (HARMONIC GEN)

DWG. NO. A 8749 B

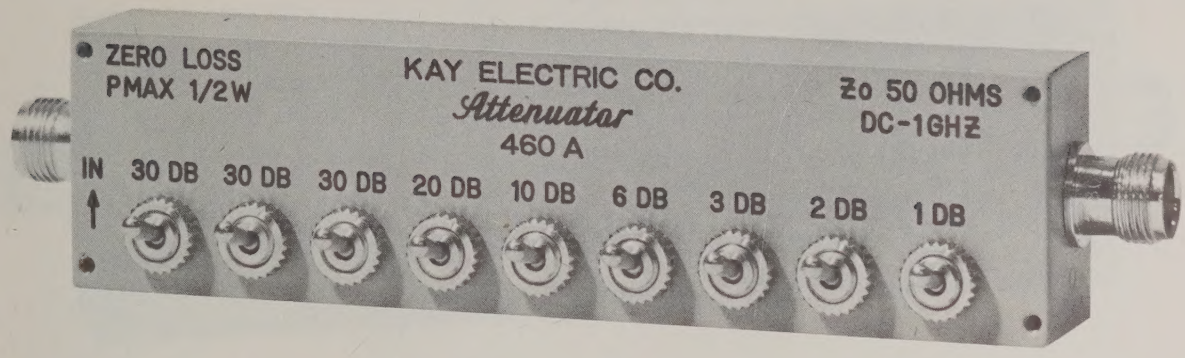


NOTE
UNLESS INDICATED OTHERWISE
ALL CAPACITANCES ARE IN μμf
ALL RESISTANCES ARE IN OHMS 1/4 W
* FACTORY SELECTED

TO J1 THRU J8 SCHEMATICS
NO C8500-C9285
PLUG IN UNIT
USE IN
MULTI-SWP 159 / MARK A-SWP 154
MARK A-SWP 1500

SCHEMATIC .1–.9MC OSC (HARMONIC) PM 7660

DWG. NO. A9572 A



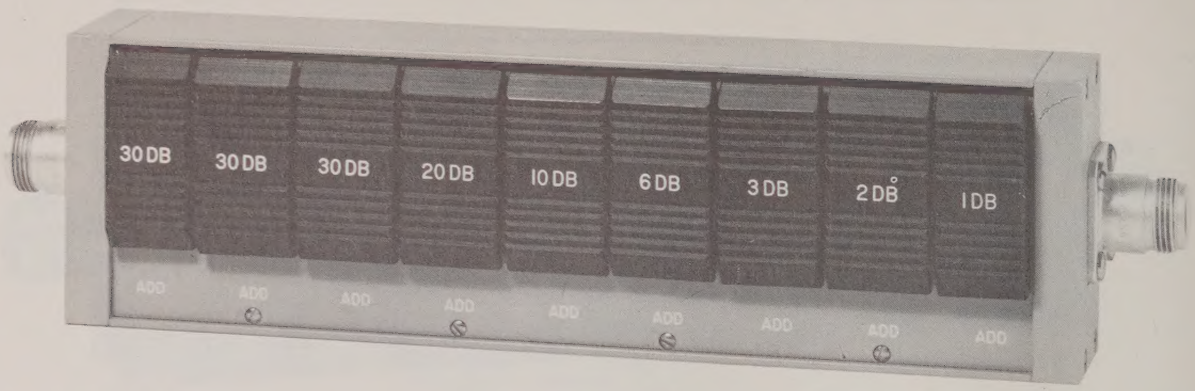
The new 100 Series attenuator, a miniature in-line model, is designed to meet the most pressing demands for a highly accurate unit in a small compact size.

These attenuators provide an accurate amount of fixed attenuation from DC to 1 GHz. Attenuation is controlled by a miniature version of Kay's own high-frequency toggle switches.

The individual steps are isolated in separate broad-tuned shielded compartments for flat band pass and response.

SPECIFICATIONS

CATALOG NO.:	460-A
FREQUENCY RANGE:	D.C. to 1 GHz
ATTENUATION STEPS:	9 Steps
(DB)	1, 2, 3, 6, 10, 20, 30, 30, 30
CONTROLS:	Toggle-Switches. Miniature high frequency type, coin-silver contacts set in teflon body.
TYPICAL OVERALL ACCURACY (±) :	1.0 DB: 0.5 GHz 1.5 DB: .5 - 1 GHz
MAXIMUM VSWR:	1.2:1, 0 - .5 GHz 1.4:1, .5 - 1 GHz
INSERTION LOSS TYPICAL (DB) :	0 - .25 GHz, ±0.05 .25 - .5 GHz, ±0.2 .5 - 1 GHz, ±0.5
POWER: (Watts)	½
DIMENSIONS:	1 3/8 x 6 1/8 x 7/8
WEIGHT:	8 oz.



The Model 110 is a new, more versatile, in-line, coaxial attenuator. Operating at frequencies from DC to 4 GHz, the 110 provides an extensive range of control of 132 DB in 1 DB steps.

Precision cavities, and new sliding block switches insure accuracy, stability and repeatability.

SPECIFICATIONS

CATALOG NO.:	461-A	
FREQUENCY RANGE:	DC to 4 GHz	
ATTENUATION STEPS:	9 Steps	
DB	1, 2, 3, 6, 10, 20, 30, 30, 30	
CONTROLS:	Slide Switches	
TYPICAL OVERALL ACCURACY (±):	0-6 DB	0-132 DB
	DC to 1 GHz - .3 DB	2% ±.2DB up to a maximum of 1.0DB
	1 to 2 GHz - .3 DB	2% ±.3DB up to a maximum of 1.5DB
	2 to 3 GHz - .4 DB	3% ±.2DB up to a maximum of 3.0DB
	At 4 GHz - .5DB	5% ±.3DB up to a maximum of 5.0DB
MAXIMUM VSWR:	D.C. to 1 GHz	1.15:1
	1 to 2 GHz	1.3:1
	2 to 3 GHz	1.5:1
	At 4 GHz	1.9:1
TYPICAL INSERTION LOSS:	At 1 GHz .2 DB	
	At 2 GHz .4 DB	
	At 3 GHz .5 DB	
	At 4 GHz .6 DB	
POWER: (Watts)	1	
DIMENSIONS:	8 3/8 x 2 3/8 x 1 5/8	
WEIGHT:	2.5 lbs.	

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